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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/580,018	05/19/2006	Johannes Bos	127898	7546
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EXAMINER				
LSTVOYB, GREGORY				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/580,018

**Applicant(s)**

BOS, JOHANNES

**Examiner**

GREGORY LISTVOYB

**Art Unit**

1796

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 April 2009.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-10 is/are pending in the application.  
4a) Of the above claim(s) 6-9 is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-5 and 10 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO/CDC)  
4) ☐ Interview Summary (PTO-413)  
5) ☐ Notice of Informal Patent Application  
6) ☐ Other: \_\_\_\_\_  
Paper No(s)/Mail Date \_\_\_\_\_



**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5 and 10 rejected under 35 U.S.C. 103(a) as being unpatentable over Vollbracht et al (US 4308374) herein in view of Vollbracht Chernykh et al (RU 2017866) herein Chernykh or Jung et al (US 5646234) herein Jung (both cited in the previous Office Action)

Vollbracht teaches a method for obtaining a an aromatic polyamide containing para-phenylene terephthalamide in the form of a crumb, by polymerizing para-phenylenediamine and terephthaloyl dichloride in a mixture of N-methyl pyrrolidone and containing calcium chloride

Vollbracht teaches is an aromatic polyamide in the crumb form, which has a relative viscosity of at least 4 and the crumb is formed directly by the copolymerizing (see Example 1).

Vollbracht teaches that his polyamide can be used for fiber formation.

Art Unit: 1796

Vollbracht does not teach 5(6)-amino-2-(p-aminophenyl)benzimidazole and ratios between the monomers, which are suitable for crumb formation.

Chernykh discloses a method for obtaining a composition for fiber formation comprising an aromatic polyamide containing para- phenylene terephthalamide and 2-(p-phenylene)benzimidazole terephthalamide units by copolymerizing: i) a= 10-80 mole % of para-phenylenediamine; ii) b=10-80 mole % of 5(6)-amino-2-(p-aminophenyl)benzimidazole; and iii) 100 mole% of terephthaloyl dichloride (see Example 1).

Note that in the Example 1 Chernykh uses Cl-para-phenylenediamine, whereas Claim 1 claims para-phenylenediamine. However, Chernykh teaches that the above compounds are equivalent (see Page 7, line 15).

Also, Chernykh teaches that DMAA and NMP as well as LiCl or CaCl<sub>2</sub> can be equally used (see Page 3, line 25).

In a mixture of N-methyl pyrrolidone and containing 2.8-4.8% wt.% of calcium chloride or lithium chloride (see Table 2, column 2), a + b is 100 mole% and i), ii), and iii) together comprise 1-20 wt.% of the mixture (see Example 1), Based on the above data the result of b x c multiplication can be less than 215.

Intrinsic viscosity of the polymer above is between 5.9 and 10.9 dl/g (see Table 2).

Jung discloses method of obtaining an aramid by polycondensation of 100 mol% terephthaloyl chloride, 40 mol% p-phenylenediamine and 60 mol% 5(6)-amino-2-(p-aminophenyl)-benzimidazole in N-methylpyrrolidone, wherein  $a+b=100$  mol% and the relative viscosity is 4,3 (see example 8).

Jung discloses solubility-promoting additives such as calcium dichloride in amounts of between 0,2 and 10 wt.%, preferably between 0,5 and 5 wt.%, can be added to the polycondensation mixture (see column 3, lines 19-35 and 62-67).

Chernykh or Jung do not disclose a crumb obtained directly by copolymerization, since their processes are intended to directly process a solution into article immediately after synthesis.

5(6)-amino-2-(p-aminophenyl)benzimidazole is a common monomer for fiber-forming polymer. Typically this compound used when high temperature resistance or broad temperature range of application is needed. Also benzimidazole known for their fire resistance and good mechanical properties (especially tensile strength and modulus).

Relations between monomer content,  $\text{CaCl}_2$  and other technological parameters in order to obtain a crumb can be adjusted by an artisan with routine experimentation approach.

Art Unit: 1796

Therefore, it would have been obvious to a person of ordinary skills in the art to apply 5(6)-amino-2-(p-aminophenyl)benzimidazole comonomer in Vollbracht's fiber-forming polyamide, since it increases temperature application range, enhances mechanical properties and possess excellent fire resistivity.

Claims 2-5 rejected under 35 U.S.C. 103(a) as being unpatentable over Chernykh et al (RU 2017866) herein Chernykh or Jung et al (US 5646234) herein Jung (both cited in the previous Office Action) in combination with Vollbracht et al (US 4308374) herein Vollbracht or Encyclopedia of Pol. Sci and Tech (Polyamides, vol 3, p. 565-567) herein Encyclopedia and the Applicant's admission of the Prior Art in the Specification ((both cited in the previous Office Action).

Chernykh discloses a method for obtaining a composition comprising an aromatic polyamide containing para- phenylene terephthalamide and 2-(p-phenylene)benzimidazole terephthalamide units by copolymerizing: i) a= 10-80 mole % of para-phenylenediamine; ii) b=10-80 mole % of 5(6)-amino-2-(p-aminophenyl)benzimidazole; and iii) 100 mole% of terephthaloyl dichloride (see Example 1).

Note that in the Example 1 Chernykh uses Cl-para-phenylenediamine, whereas Claim 1 claims para-phenylenediamine. However, Chernykh teaches that the above compounds are equivalent (see Page 7, line 15).

Art Unit: 1796

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Intrinsic viscosity of the polymer above is between 5.9 and 10.9 dl/g (see Table 2).

Jung discloses method of obtaining an aramid by polycondensation of 100 mol% terephthaloyl chloride, 40 mol% p-phenylenediamine and 60 mol% 5(6)-amino-2-(p-aminophenyl)-benzimidazole in N-methylpyrrolidone, wherein a+b=100 mol% and the relative viscosity is 4,3 (see example 8).

Jung discloses solubility-promoting additives such as calcium dichloride in amounts of between 0,2 and 10 wt.%, preferably between 0,5 and 5 wt.%, can be added to the polycondensation mixture (see column 3, lines 19-35 and 62-67).

Chernykh or Jung do not disclose a crumb obtained directly by copolymerization, since their processes are intended to directly process a solution into article immediately after synthesis.



Regarding Claims 4 and 5, Encyclopedia discloses a process of obtaining Poly(p- phenylene terephthalamide) in of N-methyl pyrrolidone at the presence of Calcium Chloride. Encyclopedia teaches a process for making a purified aromatic polyamide, which comprises coagulating and washing the crumb in water, followed by drying step (see pages 565 and 567).

Vollbracht teaches a method for obtaining a an aromatic polyamide containing para-phenylene terephthalamide in the form of a crumb, by polymerizing para-phenylenediamine and terephthaloyl dichloride in a mixture of N-methyl pyrrolidone and containing calcium chloride

Vollbracht teaches is an aromatic polyamide in the crumb form, which has a relative viscosity of at least 4 and the crumb is formed directly by the copolymerizing (see Example 1).

Vollbracht teaches that his polyamide can be used for fiber formation.

Chernykh or Jung does not teach the polymer precipitation step, since synthesis of polymer and its processing locates in one facility. However, more commonly those two processes are separated. In this case it is economically efficient to transport and store dried polymer instead of its diluted solution in N-methyl pyrrolidone.

Therefore, it would have been obvious to a person of ordinary skills in the art to precipitate Chernykh's or Jung's polymer using Encyclopedia's and Vollbracht's technology in order to expand applicability of the polyamide.

Chernykh or Jung and Encyclopedia does not disclose the crumb is defined as non-sticky particles at least 95% of which having an average diameter of 0.7-15 mm.

However, according to Applicant's discussion of the Prior Art in the Specification, such crumbs are known from the process of preparing of fully aromatic polyamides based on e.g. PPD and TDC, which products are known under the trade names Twaron® (Teijin Twaron) and Kevlar (DuPont). After polymerization in NMP/CaCl<sub>2</sub> a crumb is obtained which can be easily coagulated, washed, and dried, and the product obtained can be dissolved in sulfuric acid and shaped into a desired form, like fibers or films.

The crumbs of the above particles are very process-friendly, in particular, in a filtration step. The efficiency of the above step can be impaired with fines or sticky gels. Polymer precipitation aiming the crumbs with particular particle size can be achieved with well known technological approaches (rate of precipitant adding, temperature, stirring, etc).

Therefore, it would have been obvious to a person of ordinary skills in the art to obtain crumb with optimum particle size (i.e. 0.7-15 mm) in order to achieve efficient filtration process.

It is noted that there is no showing of unexpected results, associated with particular particle size range in the Specification.

### ***Response to Arguments***

Applicant's arguments filed 4/15/2009 have been fully considered but they are not persuasive.

Applicant argues that Vollbracht does not describe replacing a portion of the PPD with 5(6)-amino-2-(p- aminophenyl)-benzimidazole ("DAPBI") and it would not have been obvious to one of ordinary skill in the art to have combined the teachings of Chernykh with Jung to form the crumb obtained in Vollbracht using a different composition.

Examiner disagrees. It is clear that solubility of the polymer depends on its structure. Relations between monomer content,  $\text{CaCl}_2$  and other technological parameters in order to obtain a crumb can be adjusted by an artisan with routine experimentation approach.

Regarding Chernykh, Applicant argues that "Chernykh Would Not Have Provided One With Any Reason or Rationale To Have Replaced A Portion of PPD With DAPBI And Form A Crumb".

However, the primary reference (Vollbracht) provides the teaching of forming the crumb during the polycondensation process.

In addition, Chernykh teaches that DARBI-based (benzimidazole containing polymers) have better tensile strength, Young modulus and other mechanical properties, compare to ones, based on regular aromatic polyamides (see page 2, lines 45-60).

Applicant argues that Chernykh's copolymer is not equal to one claimed. Applicant submits that in Example 1 the Reference uses LiCl instead of CaCl<sub>2</sub>. In, in the Example polymer structure is different from one claimed.

However, Examiner relies on the Chernykh disclosure in its entirety, where both salts and claimed monomers are used.

According to MPEP 2123, disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments (see also *In re Susi*, 440 F.2d 442, 169 USPQ 423 (CCPA 1971), *In re Gurley*, 27 F.3d 551, 554, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994) , *In re Fulton*, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004).

Applicant argues that "The Conditions For Obtaining A Crumb Directly During The Copolymerization Are Not Described In Chernykh." Applicant submits that the copolymerization of PPD and TDC leads to a PPTA crumb and that the

Art Unit: 1796

present application embodies the scenario when a portion of PPD has been replaced with DAPBI. Prior to the present application, such a replacement formed a powder compound or a gel compound, which has been a serious problem for large-scale production of a DAPBI- containing aramid.

Examiner disagrees. Firstly, in all cases (with or without PPD or DARBI) crumb formation strictly dictates by solubility of the polymer in a system. Therefore, crumb can be formed in both cases varying solvent/non-solvent concentration, depending on the polymer structure. In other words, polyamide, based on PPD can remain in the solution if the concentration of a precipitant is not sufficient.

Applicant argues that "The Patent Office's Allegation That Chernykh Describes The Equivalence Of LiCl And CaCl<sub>2</sub> Would Be Applicable To Crumb Formation Is Incorrect".

Applicant submits Declaration under 37 CFR 1.132, where required IV of the polymer is not achieved, when LiCl is used (see Table 2 of the Declaration). However, only two concentrations of the salts (i.e. 10.71 and 8.65%wt ) was used for both LiCl and CaCl<sub>2</sub>. This is not commensurate with the scope of the claims 1 and 2, which does not claim specific salt concentration.

Regarding Jung, applicant argues that Reference fails to describe the composition of claim 2, a composition in crumb form, or how to obtain the

Art Unit: 1796

composition of claim 2 in crumb form by the use of the process (solvents and amounts of materials) of claim 1 and claim 10.

Examiner disagrees. Jung discloses method of obtaining an aramid by polycondensation of 100 mol% terephthaloyl chloride, 40 mol% p-phenylenediamine and 60 mol% 5(6)-amino-2-(p-aminophenyl)-benzimidazole in N-methylpyrrolidone, wherein  $a+b=100$  mol% and the relative viscosity is 4,3 (see example 8).

Jung discloses solubility-promoting additives such as calcium dichloride in amounts of between 0,2 and 10 wt.%, preferably between 0,5 and 5 wt.%, can be added to the polycondensation mixture (see column 3, lines 19-35 and 62-67).

Vollbracht (primary reference) teaches a method for obtaining an aromatic polyamide containing para-phenylene terephthalamide in the form of a crumb.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory

Art Unit: 1796

action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREGORY LISTVOYB whose telephone number is (571)272-6105. The examiner can normally be reached on 10am-7pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James Seidleck can be reached on (571) 272-1078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Art Unit: 1796

/James J. Seidleck/

Supervisory Patent Examiner, Art Unit 1796

GL